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Predictors of Postoperative 30 Days Unplanned Readmission among Patients Undergoing Cardiac surgeries

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Abstract

Background: Unplanned 30-day readmissions following cardiac surgery have been associated with increased healthcare costs and adverse events for both patients and care providers. **Aim:** To identify perioperative predictors of hospital readmission after cardiac surgeries. **Research design:** A prospective (cohort) research design. **Setting**: Cardiothoracic surgery department at Assiut university heart hospital. **Sample:** A convenience sample of 121 adult patients who had undergone coronary artery bypass graft (CABG) or valves surgeries. **Tools: Tool I:** Patient assessment sheet, **tool II:** A clinical risk scoring tool to predict readmission after cardiac surgery. **Results:** Out of 121 patients, 28 patients (23.1%) were readmitted to hospital classified according to procedure into: single valve 35.7%, Isolated CABG 35.7%, multiple valves 17.9%, and combined (valves and CABG) 10.7%. Univariate and multivariate regression demonstrated that history of congestive heart failure(CHF), previous percutaneous coronary intervention(PCI), haematocrit level (< 34%), abnormal ejection fraction (<50%), cardiopulmonary bypass machine time (>120min), postoperative myocardial infarction(MI), cardiac arrhythmia, acute kidney injury(AKI), bleeding, major blood transfusion, surgical site infection(SSI), and length of hospital stay (LOS) (> 9 days) were identified as significant independent perioperative readmission predictors for cardiac surgeries **Conclusion:** The study highlights the ongoing challenge of hospital readmissions after cardiac surgery. Pre-operative risk factors, intraoperative data, and post-operative complications are key predictors. Implementing strategies to manage these factors can reduce readmissions. **Recommendation:** Perioperative predictors must be identified and controlled as early as possible to reduce readmission rate.

Keywords: Cardiac surgery, Postoperative, Predictors, Readmission &Unplanned.

Introduction

Cardiac surgery continues to play an important role in the management of various cardiovascular disorders, including the treatment of seriously and critically ill patients. The most frequently performed procedures include CABG and valvular surgery **(Demissie et al., 2023)**. According to the society of thoracic surgeons, the number of cardiac surgeries exceeds 300000 procedures in 2019 in the United States **(Bowdish et al., 2021)**. Despite tremendous advancements in cardiac surgery over the past few years, postoperative hospital readmissions after cardiac surgeries still present significant challenges **(Demissie et al., 2023).** Cardiac readmission was defined as an unplanned, overnight stay, occurring more than 24 hours after discharge within 30 days and due to a cardiac cause or cause presumably related to the surgery **(Weiss et al., 2020)**. Readmission within 30 days of adult cardiac surgery is a difficult and costly problem, with rates ranging from 8% to 24% **(Almramhi et al., 2022)**. Readmission after cardiac surgery is common and moderately predictable, beyond delayed functional recovery and diminished quality of life, hospital readmission poses a significant financial burden on both patients and healthcare institutions. **(Khoury et al., 2019)**.

Perioperative nurses demonstrably influence hospital readmissions. Pre-operatively, they conduct thorough assessments, educate patients, and optimize health, laying the groundwork for a successful surgery. Intraoperatively, meticulous aseptic technique, safe medication administration, and vigilant monitoring minimize complications and promote healing. Post-operatively, they manage pain, facilitate rehabilitation, and collaborate on discharge planning for a smooth transition home. Even following discharge, telephone follow-up and home visits ensure patient well-being, identify potential issues, and prevent complications, further reducing readmission. **(Audet et al., 2021)**

Significance of the study

According to a study conducted in the USA on more than one million cardiac surgery procedures, which included the 30-day, hospital readmission rate for

CABG was 12.8% and for valvular surgeries 14.5% **(Hirji et al., 2020)**. In Egypt, early hospital readmission after cardiac surgery is common and accounts for 8–24% **(Abdelnabey et al., 2014)**

Based on his two-year clinical experience at Assiut University Heart Hospital, the researcher observed a significant proportion of post-discharge cardiac surgery patients readmitted to the hospital. This highlights the critical need to investigate and identify key factors that significantly predict patient readmission risk.

Aim of the study:

The current study was conducted to assess rate & predictors of hospital readmissions among patients undergoing cardiac surgery.

Research questions:

1. What is the rate of readmissions following cardiac surgeries?
2. What are the most common causes for readmissions after cardiac surgeries?
3. What are the predictors of hospital readmission for patients undergoing cardiac surgeries?

Operational definition:

Predictors: is any factor (such as a patient characteristic, history, symptom, sign, or test result) associated with the effect of a specific procedure or treatment in persons with a particular disease or health condition. **(Riley et al., 2019)**

Methods

Research design:

A prospective (cohort) research design was utilized to carry out this study.

Setting:

The study was conducted at Cardiothoracic surgery department at Assiut university heart hospital.

Sample:

A total of 121 adult patients (including an additional 10% to account for potential missing data (Assiut University Heart Hospital records., 2022) who underwent CABG and/or valve surgeries, with ages ranging from 18 to 65 years, were enrolled in the study. patients required a repeat operation, a psychiatric diagnosis, or those who declined participation were excluded.

Tools of data collection:

Two tools were utilized for data collection to fulfill the study's objectives:

Tool (I): Patient's assessment sheet:

A researcher-developed tool was created based on a comprehensive review of national **(Abdelnaby et al., 2014)** and international literature **(Tam et al., 2018)** this tool included five parts:

Part 1: Demographic data:

This section of tool was used to collect patients' demographic data such as age, gender, marital status, residence, job, and educational level.

Part 2: Clinical and medical data:

This part was used to assess the health history of studied patients such as the history of previous cardiac procedures, hypertension, diabetes, obesity, any blood, or blood product transfusion, and Body Mass Index.

Part 3: Diagnostic studies:

- Laboratory studies such as Kidney function test, Complete Blood Count (CBC), liver function test, Hepatitis C Virus (HCV), Hepatitis B Virus (HBV), Human Immunodeficiency Virus (HIV), Random blood sugar, Hemoglobin A1c (HBA1c), and bleeding profile
- Electrocardiogram (ECG)
- Imaging studies such as echocardiography to identify the efficiency of cardiac function.

Part 4: Operative data:

It included data pertaining to intraoperative monitoring such as aortic cross clamp time **(Khassawneh et al., 2023)** and cardiopulmonary bypass time. **(Milojevic et al., 2023)**

Part 5: Postoperative data:

This part included data pertaining to the postoperative period such as vital signs, especially heart rate and body temperature monitoring and postoperative complications such as bleeding and wound infection.

Tool II: A Clinical Risk Scoring Tool to Predict Readmission after Cardiac Surgery:

This tool was used to predict risk scores for readmission after discharge in cardiac surgery including five parts adopted from **(Tam et al., 2018).**

Part 1: Preoperative Risk Factors:

This part was used to assess the risks associated with patients prior to the procedure including thirteen items include age, sex, urgent or emergent procedure, hypertension, diabetes, history of CHF, history of MI, peripheral vascular disease, COPD, previous PCI, dialysis, BMI, and creatinine level

Part 2: Specific Surgical Procedure:

This part was used to evaluate the risks associated with the specific type of surgical procedure including one item (procedure type such as multiple valves and CABG, single valves and CABG, multiple valves, and single valve**)**

Part 3: Potential In-Hospital Complications:

This part was used to assess the risks of post-operative complications that may occur while the patient is in the hospital including sex items (acute MI, arrythmia, acute kidney injury, major transfusion (4+ units of RBCs), any blood product transfusion, and surgical site infection.

Part 4: Length of Hospital Stay:

This part was used to evaluate the risks associated with the patient's duration of stay in the hospital after

the procedure including one item.

Part 5: Discharge Risk Factors:

This part was used to assess the risks associated with the discharge with supports compared to discharge home independently.

The scoring system used to predict readmission:

Scoring system:

Patients are categorized into five risk groups based on their total score, ranging from lowest risk (0-5) to highest risk (14+). The risk scoring system is a tool used to predict the likelihood of a patient being readmitted to the hospital after cardiac surgery. The system assigns points to each of 22 factors that have been shown to be associated with an increased risk of readmission. Patients in the highest risk group are more likely to be readmitted to the hospital than patients in the lower risk groups. The total score is then used to categorize patients into one of five risk groups:

1. Lowest risk: Score 0-5
2. Lower risk: Score 6-8
3. Moderate risk: Score 9-10
4. High risk: Score 11-13
5. Highest risk: Score 14+

Procedures:

To accomplish the aim of the study, it passed through the following phases**: I: Preparatory phase:**

Tools development:

- Official permission was obtained to carry out the proposed study, enabling the researcher to initiate data collection**.**
- Tools for collecting data were developed based on reviewing the current, past, local, national **(Abdelnaby et al., 2014)** and international **(Tam et al., 2018)** related literature in various aspects.

Pilot study

A pilot study was conducted on 10% of patients (11 patients) to evaluate the clarity, feasibility and applicability of tools. Carrying out the pilot study gave the investigator experience to deal with the included subjects, and the data collection tools. Based on the results of the pilot study, refinements and modifications were done in the data collection instruments. Because modifications were minor and didn't affect the main data, subjects who were shared in the pilot study were included in the actual study sample.

Content validity and Reliability

Face validity: Tools validity were tested by panel of five professional health care providers including four faculty members of Medical -Surgical Nursing Faculty of Nursing, Assiut University, and an Assistant professor of cardiothoracic surgery Faculty of Medicine, Assiut University who reviewed the tool, for clarity, relevance comprehensive, understanding, applicability and easiness.

Reliability of the tools was measured by Cronbach's alpha which was (r-0.837).

Ethical considerations

Research proposal was approved from Ethical Committee in the Faculty of Nursing, Assiut University on August 2023, with ID approval (1120240661). There was no risk for study subject during application of the study. Confidentiality and privacy of the studied patients were asserted by the investigator. Explanation of the aim and nature of the study was done to studied patients and the right to refuse participation in the study was emphasized to the patients. Verbal consent was obtained from patients who participated in the study.

Implementation phase:

Data collection for this study occurred from October 2023 to March 2024. The investigator was present at the designated setting four days per week during both morning and afternoon shifts to recruit patients and collect relevant data.

After obtaining informed consent, patients were interviewed preoperatively using a standardized data collection tool (Tool I, Part 1) to assess their demographics and medical history. Tool I (Parts 2 & 3) was then utilized to capture preoperative medical data. Intraoperatively, data regarding the surgical procedure (Tool I, Part 4) was collected either in the operating room or post-anesthesia care unit.

Postoperative data (Tool I, Part 5) was obtained once patients were transferred to the ward. A separate tool (Tool II) was employed to assess risk factors for readmission. All patients were monitored for readmission for up to 30 days post-discharge through phone calls, in-person follow-up appointments, or visits to cardiothoracic surgical wards. Following data collection, the investigator addressed any patient misconceptions or gaps in knowledge regarding cardiac surgery and its potential complications. Additionally, the importance of adhering to scheduled follow-up appointments was emphasized.

Statistical analysis:

Data entry and data analysis were done by using SPSS program (Statistical Package for Social Science) version 26. Data presented as number, percentage, mean and standard deviation. The Chi-square test and logistic regression analysis was performed to determine readmission predictors after cardiac surgeries. Univariate and multivariate logistic regression analysis were used to evaluate dependent and independent prognostic risk factors on readmission after PNL. P value considered statistically significant when $p < 0.05$.

Results

Tables (1): Distribution of studied patients according to their demographic data (n=121)

Demographic data	N	%
Age		
20 ≤ 40	17	14.0
40 ≤ 60	45	37.2
60 - 65	59	48.8
- Mean age ±SD yrs.	58.62±11.052(20-65)	
Gender		
Male	72	59.5
Female	49	40.5
Marital status		
Married	84	69.4
Un Married	37	30.6
Mean BMI ±SD (range)	28.4± 4(23.2-41)	
Educational level		
Educated	90	74.4
Not educated	31	25.6
Occupation		
working	49	40.5
Not working	72	59.5
Residence		
Urban	59	48.8
Rural	62	51.2

**SD – standard deviations*

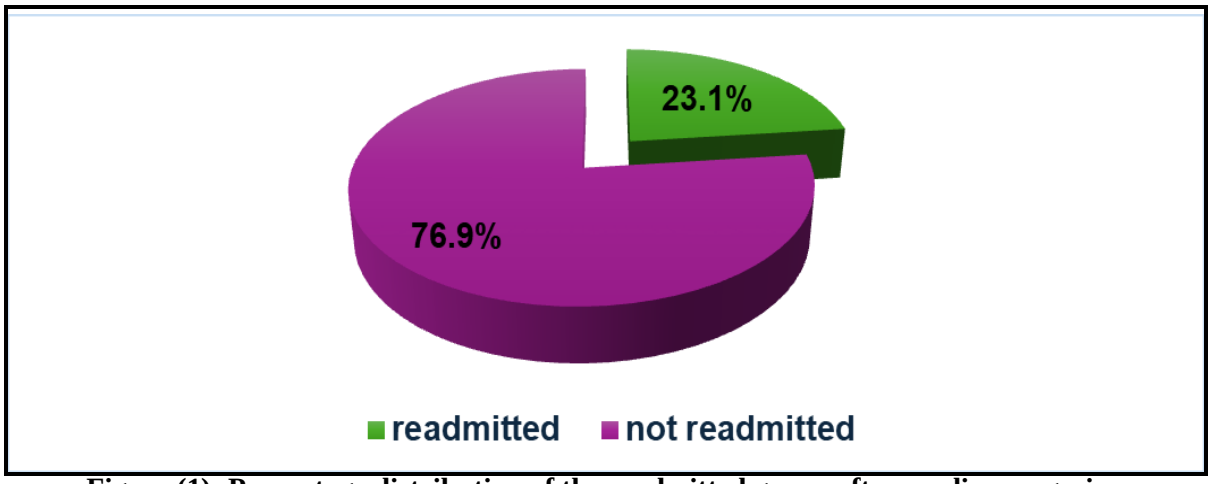

Figure (1): Percentage distribution of the readmitted group after cardiac surgeries.

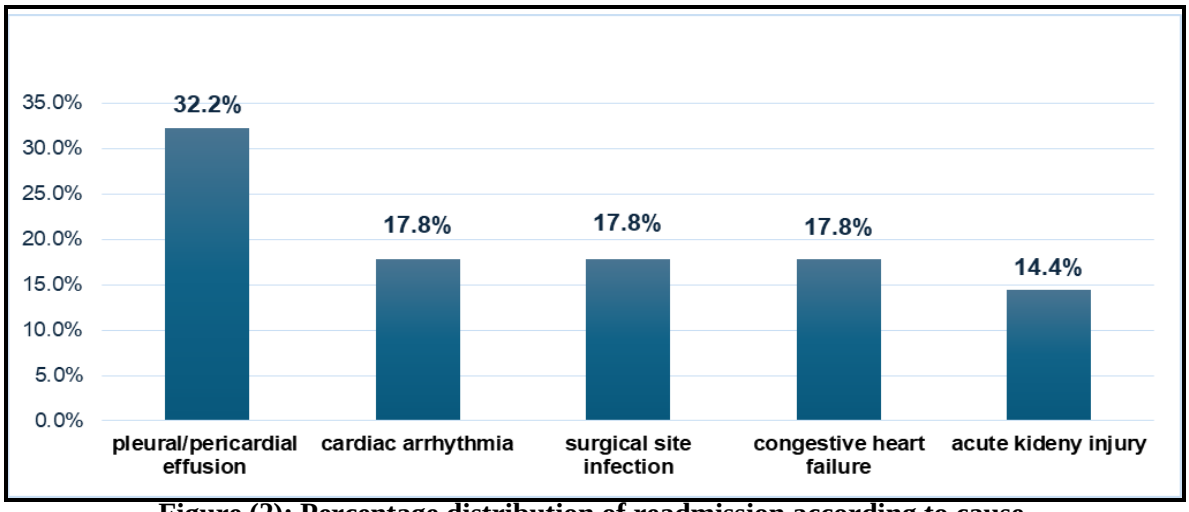

Figure (2): Percentage distribution of readmission according to cause.

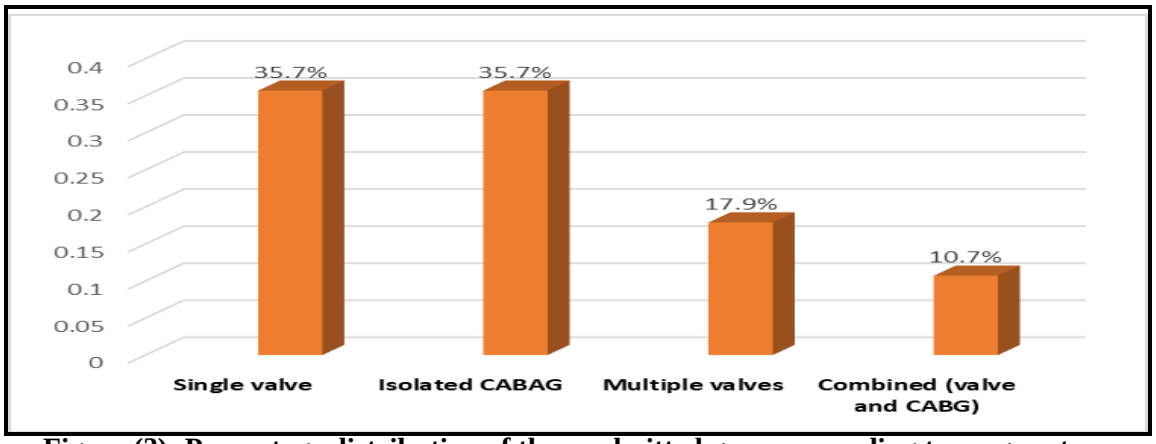

Figure (3): Percentage distribution of the readmitted group according to surgery type

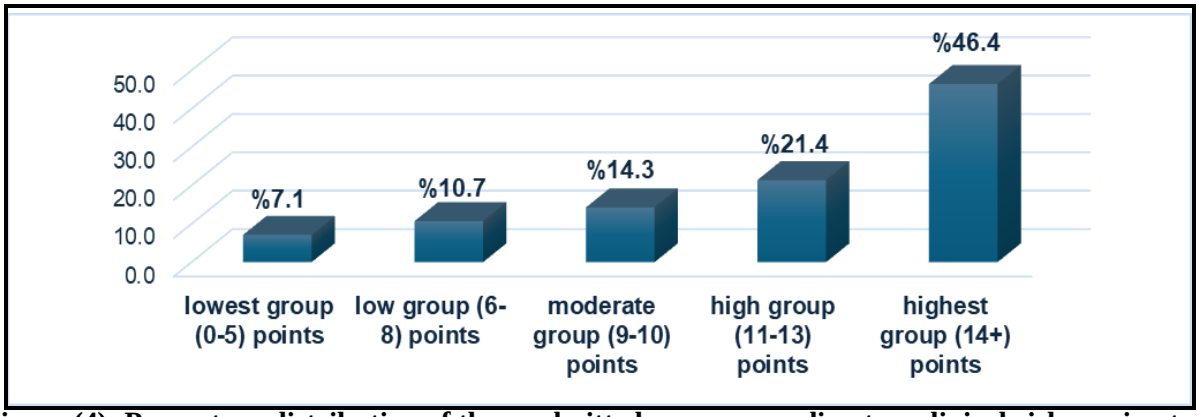

Figure (4): Percentage distribution of the readmitted group according to a clinical risk scoring tool to predict readmission after cardiac surgery.

Table (2): Univariate and multivariate logistic regression analysis of perioperative readmission predictors

Perioperative readmission predictors	Univariate			Multivariate		
	OR	95% CI	P-value	OR	95% CI	P-valu
Preoperative predictors						
History of CHF	3.790	(1.652-8.693)	0.002**			
Previous PCI	2.250	(1.003-5.046)	0.049*			
Previous cardiac surgery	3.869	(1.539-9.727)	0.004**			
Creatinine level (>121µmol/L)	0.334	(0.132-0.850)	0.021*			
Hematocrit level (< 34%)	0.252	(0.095-0.669)	0.006**			
Left ventricle ejection fraction (< 50%)	0.334	(0.132-0.850)	0.021*	0.006	(0.000-0.349)	0.014*
Intraoperative predictors						
Cardiopulmonary bypass machine time (> 120min)	0.120	(0.041-0.352)	<0.001**	35.24	(1.088-114.49)	0.045*
In-hospital complications						
Acute MI	4.277	(1.676-10.918)	0.002**			
Arrhythmia	4.906	(2.091-11.508)	<0.001**			
Acute kidney injury	10.658	(3.654-31.087)	<0.001**	110.64	(1.44-849.12)	0.034*
Bleeding	3.790	(1.652-8.693)	0.002**			
Major transfusion (4+ units of RBCs)	6.458	(2.155-19343)	0.001**			
Surgical site infection	18.444	(5.509 -61.752)	<0.001**	35.62	(2.336-543.06)	0.010*
LOS (>9days)	0.026	(0.009-0.079)	<0.001**			

Dependent variable is (patient readmission) *RBCs: red blood cells MI: myocardial infarction*
**Statistically significant predictor at P. value <0.05 CHF: congestive heart failure*
***Statistically significant predictor at P. value <0.01 PCI: percutaneous coronary intervention*

Table (1): Rrevealed an average patient age (58.62 ± 11.052) years old. Males comprised less than two-thirds of the patients, with over two-thirds being married. The average BMI was (28.4 ± 4). Regarding education, three-quarters of the patients were educated, while less than two-thirds of patients were not employed. Finally, a little over half of the patients resided in rural areas.

Figure (1): Illustrated the distribution of readmission rates within the study cohort. Notably, twenty-eight patients (about one quarter) of studied patients were readmitted to hospital after cardiac surgeries.

Figure (2): Analyzing readmissions by cause. Revealed several key findings. The most frequent reasons for readmission were pericardial/pleural effusion (around a third), cardiac arrhythmia (around one-fifth), surgical site infection (around one-fifth), congestive heart failure (around one-fifth), and acute kidney injury (around one-seventh).

Figure (3): Analyzing readmissions regarding surgery types, valvular surgeries (either single or multiple valves) constituted the most common category for readmitted patients, encompassing over half of the cases. CABG procedures followed in frequency, representing approximately one-third of readmissions. Finally, a smaller proportion of patients (around one-tenth) underwent combined valve and CABG procedures. The average length of stay for readmitted patients was 8.4 days, with a standard deviation of 3.5 days.

Figure (4): Depicts the percentage distribution of readmitted patients according to their perioperative risk scores. Patients with scores ranging from 0 to 5 points, representing the lowest risk category, comprised approximately 7.1% of the readmitted group. The proportion of readmitted patients increased incrementally with higher risk scores. Those scoring 6-8 points constituted 10.7%, followed by 14.3% for scores of 9-10 points. The risk of readmission rose substantially for patients with scores of 11-13 points, who accounted for 21.4% of readmissions. Notably, the highest risk category, encompassing patients with scores of 14 points or more, represented the largest proportion of readmitted patients at 46.5%.

Table (2): Univariate logistic regression analysis revealed statistically significant differences in perioperative factors between readmitted and non-readmitted patients. A history of CHF, prior PCI, prior cardiac surgery, elevated creatinine levels (>121 μmol/L), hematocrit levels (≤34%), LVEF (<50%), prolonged cardiopulmonary bypass time (>120 minutes), postoperative MI, AKI, bleeding, major transfusion (≥4 units packed red blood cells), wound infection, extended length of stay (>9 days), and discharge requiring support were all identified as significant independent predictors of readmission (p-values: 0.002, 0.049, 0.004, 0.021, 0.006, 0.021, 0.000, 0.002, 0.000, 0.000, 0.002, 0.001, 0.000, 0.000, respectively). Multivariate analysis identified LVEF <50%, prolonged bypass time (>120 minutes), AKI, and wound infection as independent predictors of readmission (p-values: 0.014, 0.045, 0.034, 0.010, respectively

Discussion:

This study investigated a sample of one hundred twenty-one patients. Their demographic characteristics revealed a mean age around sixty years. This finding aligns with previous research by **Almramhi et al. (2022)** who reported a mean patients age around fifty-seven years, an**d Kilic et al. (2017)** who found a mean patients age of sixty-one years. Regarding gender distribution, nearly two-thirds of the study population were male, while the remaining one-third were female. This is consistent with observations by **Kilic et al. (2017)** and **Espinoza et al. (2016)**, who reported a higher prevalence of male patients undergoing cardiac surgery compared to females.

From point of view, men more likely to perform cardiac surgeries due to hormonal differences such as lower levels of estrogen hormone, which may play a protective role against heart disease, lifestyle factors: men are more likely to smoke, have high blood pressure, and have high cholesterol levels, all of which are risk factors for heart disease.

An examination of the studied patients' BMI revealed a mean of twenty-eight (overweight). This aligns with the findings of **(Triantafillou, 2023)** who reported a mean BMI of twenty-eight in their study population. Furthermore, the current study demonstrates that most patients exhibited elevated BMI levels. This observation is consistent with the work of **(Almramhi et al.2022)**, who identified a high prevalence of obesity among individuals diagnosed with cardiac disease. Moving on to educational attainment, approximately three-quarters of the studied patients reported having received some form of education. This finding echoes the results of **(Lynggaard et al.2020)**, who observed a similarly high level of educational attainment within their patient pool.

The current study revealed that the rate of patients' readmission was around one quarter of studied patients. This finding is nearly similar to **Weiss et al., (2020)** who reported in their study that early readmission rate was one quarter and suggested this follow rate, it may be due to major complications that were experienced by their patients after cardiac surgeries such as pericardial/pleural effusions, sternal wound infections, Arrhythmia. Also, this finding is

similar with **Ilkjaer et al., (2023)** who reported in their study that early readmission rate within thirty days after discharge was around one fifth.

In contrast to our findings, previous studies by **Lv et al., (2022); Carmo et al., (2020), & Trooboff et al., (2019)** reported readmission rates of (almost four percent, slightly less than ten percent, and just over twelve percent,) respectively, post cardiac surgeries. From the investigator's perspective, this disparity in readmission rates could be attributed to various factors, including perioperative factors or predictors. Our study subsequently explored the association between these factors and readmission after cardiac surgeries.

Regarding readmission causes, the current study revealed that about one third of readmitted patients were readmitted to hospital due to pericardial/pleural effusion, this finding was in agreement with **Weiss et al., (2020)** who reported that the most common cause for early readmission after open-heart valve surgery was pericardial/pleural effusion (about one third of readmitted patients). Also, **Trooboff et al., (2019)** added that one of the most common causes of readmission post cardiac surgeries was pericardial/pleural effusion.

Moreover, the current study reported that around one fifth of patients readmitted due to cardiac arrhythmia, this finding is in line with **Shawon et al., (2021)** "who revealed that between four point five- and twenty-six-point seven percent of readmitted patients had hospital readmission after cardiac surgery due to cardiac arrhythmia. Also, **Weiss et al., (2020)** mentioned that atrial flutter or fibrillation was identified as a relatively common reason for readmission after cardiac surgery, affecting approximately one in five readmitted patients.

The current study revealed that around one fifth of patients were readmitted to hospital due to surgical site infections (SSIs). Which include primary site (superficial and deep sternal wound) or secondary site (graft harvesting site in CABG). This finding was in line with **(Ibrahimoglu, 2019)** who reported that fourteen-point four percent of patients were readmitted to hospital due to surgical site infections (SSIs) and he had pointed out that risk factors for surgical wound infection were patient age, sex, diabetes mellitus (DM), obesity, and smoking played a role, the surgery itself also contributed to these risks. Longer operation times, blood transfusions, the type of graft conduit used, and the need to reopen the chest have been identified as significant contributors to SSI development. **Also, Hirji et al., (2020)** mentioned that around one fifth of patients were readmitted to hospital due to wound infection.

The current study revealed that around one fifth of patients were readmitted to hospital due to congestive heart failure. Similar to our findings **Almramhi et al., (2022)** who mentioned in multivariate logistic regression that congestive heart failure was one of the most common causes of readmission following cardiac surgeries.

Also, our study revealed that approximately one in seven of readmitted patients due to acute kidney injury (AKI). This finding in congruent with **Beckles et al., (2022)** who reported that readmission rate for patients with AKI post CABG after using ultrafiltration was slightly over one tenth.

The analysis found that around a quarter of patients required readmission after heart valve surgery, CABG, or a combined procedure involving both. More specifically, the breakdown of readmissions by procedure type was slightly over a third for single valve replacement, slightly over a third for isolated CABG, around one-seventh for multiple valves, and a bit less than one-eighth for combined procedures. These findings are consistent with **Almramhi et al. (2022)** who reported similar readmission rates.

This study explored readmission rates using a new risk score based on the number of a patient's perioperative risk factors. Patients were grouped by their score: the lowest risk category (zero to five points) had less than one-tenth of readmissions. Importantly, the percentage of readmitted patients grew steadily with higher scores. The 'lower risk' group (six to eight points) was roughly one-tenth, followed by a 'moderate risk' group (nine to ten points) at around one-seventh. A significant jump in readmission risk occurred for the 'high risk' group (eleven to thirteen points) who made up over one-fifth of readmissions. The highest risk category (fourteen or more points) had the largest share of readmissions, at nearly one-half. This finding was nearly identical to previous studies **(Tam et al., 2018).**

Regarding preoperative predictors the present study revealed history of CHF was predictor for patient readmission, our finding in agreement with **Almramhi et al., (2022)** who noted that there was significant relation between CHF and thirty days readmission also mentioned in multivariate logistic regression that the CHF with preoperative history was one of the most common causes of readmission following cardiac surgeries.

From point of view a history of CHF is a strong predictor for patient readmission after cardiac surgery due to the underlying heart condition, increased risk of complications, and potential challenges in post-operative recovery and medication management

The current study revealed statistically significant differences in prior PCI and previous cardiac surgery between readmitted and non-readmitted patients. These findings align with the work of **Sharif Sabe et al. (2023)**, who similarly observed significant

differences in these factors between readmission groups. However, our results diverge from those of **Borregaard et al. (2019)**, who reported no significant association between prior PCI/cardiac surgery and readmission.

The present study indicated that there was a significant difference between readmitted and non-readmitted patients regarding preoperative hematocrit level (less than thirty-four percent). This finding was in line with **Trooboff et al., (2019)** who reported that a preoperative hematocrit level of less than thirty-four percent increased hospital readmission. In contrast to our finding, **Almramhi et al., (2022)** clarified that a lower preoperative hematocrit level (less than thirty-four percent) was not found to be a significant risk for readmission.

The current study shows that there were statistically significant differences between readmitted and non-readmitted patients regarding left ventricle ejection fraction (less than fifty percent). This finding agreed with **Mary, (2017)** who stated that low left ventricle ejection fraction was modifiable risk factor for readmission after CABG. Also, **Beckles et al., (2022)** reported that low ejection fraction is a significant predictor of mortality following CABG surgery. It can lead to fluid overload (FO) and acute kidney injury post-CABG, necessitating readmission and interventions such as ultrafiltration and renal replacement therapies.

Regarding Intraoperative data, the current finding reflected that cardiopulmonary bypass machine time (more than one hundred twenty minutes) is a significant predictor for hospital readmission. This finding agrees with **Weiss et al., (2020)** who reported that patients who required more time for extracorporeal circulation were more likely to be readmitted after cardiac surgery.

Regarding postoperative complications, our study revealed that postoperative acute myocardial infarction, arrhythmias especially atrial fibrillation and prolonged length of hospital stay (more than nine days) where predictors for patient's readmission. These findings were in line with **Sultana et al., (2022)** who mentioned that atrial fibrillation and acute myocardial infarctions had highly significant association with both Length of hospital stay and readmission. Also mentioned that the optimal inpatient length of stay was associated with lower readmission rate.

The present study revealed that there were statistically significance differences between readmitted and non-readmitted patients regarding preoperative creatinine level (more than one hundred twenty-one µmol/L) and postoperative acute kidney injury as predictors of readmission following cardiac surgeries. Like our finding **Trooboff et al., (2019) & Zhong et al., (2021)** who mentioned that creatinine level equal or more than two mg per dl was statistically significant differences between readmitted and non-readmitted patients as one of predictors for readmission following cardiac surgeries and abnormal preoperative serum creatinine was associated with increased readmission after cardiac surgeries.

Postoperative bleeding was a statistically significant difference between readmitted and non-readmitted patients. **Abdelnabey et al., (2014)** illustrated that postoperative bleeding was one of hematological complications which was significantly difference between readmitted and non-readmitted patients. **Borregaard et al., (2019)** clarified that major blood transfusion during surgery and / or at intensive care unit due to bleeding during or just after cardiac surgery was statically significant difference between readmitted and non-readmitted patients.

The present study revealed that there were statistically significance differences between readmitted and non-readmitted patients regarding surgical site infection and its one of predictors of readmission. This finding is similar with **Zukowska & Zukowski (2022)** who's found statistically significant differences in SSI rates between readmitted and non-readmitted patients following cardiac surgery. This association was attributed to complications arising from SSIs, including a decline in postoperative quality of life, increased mortality, prolonged hospital stays, and higher treatment costs.

Finally, the present study revealed that there were statistically significance differences between readmitted and non-readmitted patients regarding length of hospital stay. Patients with longer hospital stays after cardiac surgery are more likely to be readmitted. This finding is similar with **(Sultana et al., 2022)** who's indicating an inverse relationship exists between LOS and readmission rates following cardiac surgery. This observation suggests that prolonged LOS may serve as a predictor of readmission risk in this patient population.

Conclusion:

Based on the results of current study; it can be concluded that, hospital readmission following cardiac surgery remains a persistent challenge, The identification of pre-operative risk factors, such as low hematocrit level, creatinine level, and low ejection fraction, plays a crucial role in predicting readmission risk. Additionally, Intraoperative data like prolonged cardiopulmonary bypass machine time and postoperative complications like wound infection, postoperative bleeding, postoperative arrhythmia, myocardial infarction, acute kidney injury, and hospital length of stay exceeding nine days, have

been identified as significant predictors. Implementing strategies focused on predicting and managing these risk factors has the potential to reduce readmission rates and improve patient outcomes.

Recommendations:

- Implementing strategies focused on predicting and managing these risk factors has the potential to reduce readmission rates and improve patient outcomes
- Establish dedicated units with advanced tools to identify and intensively monitor patients with a high risk of readmission.
- Develop a structured system for high-risk patients, including phone consultations and home visits by qualified healthcare professionals.
- Establish a dedicated hotline to provide guidance and address concerns after discharge, particularly accessible for emergencies.

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